



# Network Assets Standard

## Standard for the use of CAD Software

These standards created and made available are for the construction of Ergon Energy infrastructure. These standards ensure meeting of Ergon Energy's requirements. External companies should not use these standards to construct non-Ergon Energy assets.

If this standard is a printed version, to ensure compliance, reference must be made to the Ergon Energy internet site [www.ergon.com.au](http://www.ergon.com.au) to obtain the latest version.

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Abstract: This standard provides guidance on CAD standards in use for Ergon Energy.

Keywords: CAD, MicroStation, AutoCAD, EDMS, Graphic, Model, Drawings

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## 1 Overview

### 1.1 Purpose

This manual is intended to apply to all CAD software packages. Workspace configurations have been developed for MicroStation and AutoCAD products to make it easier to apply the graphic concepts in this manual.

Consideration has also been given to governance by Ergon Energy's Electronic Document Management System (EDMS), and associated viewing software AutoVue when compiling certain features of these standards.

The purpose of this document is to provide readers with the CAD Standards adopted by Ergon Energy for the disciplines of electrical, mechanical, civil, transmission lines, mapping and communications areas for construction and maintenance activities.

## 2 References

### 2.1 Ergon Energy controlled documents

Document number or location (if applicable)	Document name	Document type
EEAD-0001	EDMS Viewer Manual	Ergon Energy EDMS Manual
EEAD-0002	EDMS Approver Manual	Ergon Energy EDMS Manual
EEAD-0003	EDMS Author Manual	Ergon Energy EDMS Manual
EEAD-0004	EDMS Author Handbook - AutoCAD	Ergon Energy EDMS Manual
EEAD-0005	EDMS Author Handbook - Microstation	Ergon Energy EDMS Manual
EEAD-0006	EDMS Operating Schematics User Manual	Ergon Energy EDMS Manual
EEAD-0013	EDMS Ergon Energy Standards user Manual	Ergon Energy EDMS Manual
EEAD-0015	AutoVue User Guide	Ergon Energy EDMS Guide
EEAD-0016	Archiving and Superseding Guide – Design Drawing Document Class	Ergon Energy EDMS Guide
EEAD-0046	EDMS Operating Schematics Approvers Handbook	Ergon Energy EDMS Handbook
EEAD-0060	EDMS Single Line Diagram Operating (SDLO) User Guide	Ergon Energy EDMS Guide
EEAD-0101	Electronic Drawing/Document management System “Contract Author” User Manual	Ergon Energy EDMS Manual
EEAD-0106	Operating Schematics Preliminary Rendition Process Guide	Ergon Energy EDMS Guide

## 2.2 Other documents

Document number or location (if applicable)	Document name	Document type
AS 1100.101-1992 (R2014) (Standards Australia)	Technical drawing - General principles	Standard
AS/NZS 4383.1:1996 (Standards Australia)	Preparation of documents used in electrotechnology – Part 1: General requirements	Standard
AS ISO 1000-1998 (Standard Australia)	The international system of units (SI) and its application	Standard

## 3 Legislation, regulations, rules, and codes

Electrical Safety Regulation section 198 section (f) stipulates that design, construction, operation and maintenance records necessary for the electrical safety of the works must be kept in an accessible form. (Electrical Safety Regulation 2013, section 198)

## 4 Definitions, acronyms, and abbreviations

### 4.1 Definitions

For the purposes of this standard, the following definitions apply:

Term	Definition
Microstation	CAD software package
AutoCAD	CAD software package
EDMS	Ergon Energy's Electronic Document Management System

### 4.2 Acronyms and abbreviations

The following abbreviations and acronyms appear in this standard.

Term, abbreviation or acronym	Definition
CAD	Computer Aided Design

## 5 Guidelines

This section provides general guidelines on CAD standards and information the Electronic Document Management System (EDMS).

### 5.1 Electronic Document Management System

The Electronic Document Management System (EDMS) is server-based software that stores and maintains electronic documents in a library. The EDMS manages drawings through their complete life cycle from creation, review, approval, issue for construction, amendment, storage, access for reference and eventual archival. The EDMS is accessed via Internet Explorer.

The EDMS has been installed and configured to reduce the problems associated with archiving, capturing, controlling, finding, retaining, reviewing, revising, viewing, routing and workflow of drawings and documents.

Quality assurance within the movement of drawings has been achieved by ensuring there is a standardised process from creation of new drawings by Authors to Final Release across the organisation.

Provision has also been allowed for parent/child relationships between drawings. For example, external references or image files can be associated to the parent file.

Each user is a member of one or more groups. The groups are typically Author, Checker, Reviewer, Business Requirements Officer, Key User, Document Controller, Layout Officer, Layout Supervisor and Viewer. These groups have been assigned various properties and securities, such as viewing, modifying, deleting, printing etc.

When you add a document to the library, you must assign a document class to it. The document class determines other properties required. These properties describe the document, its location, versions and status. Each document has access rights that determine which users or groups can work with it. Documents can also be indexed, allowing you to do a content base search.

Project documents are stored in the Production library, where they are secure from accidental deletion or misfiling.

When a document is initially added to the library the system assigns a unique number, known as the Item ID. If you wish to edit a document you check it out of the library. The system copies the latest version of the document to a designated directory and marks the document has checked out.

When revisions are complete, you check the document into the library, creating another document version.

### 5.2 Drawing Numbering Scheme

The Drawing Numbering Scheme is controlled by the EDMS. The drawing number is automatically generated when a file is added to the EDMS as a new Document or can have a unique number assigned. Refer to the EDMS online documentation for details. All drawings are identified by a unique number which consists of a document number and a sheet number.

## 5.3 Revision Control

The Revision Numbering is handled by the EDMS. As a drawing moves through its lifecycle the relevant status is indicated and updated by EDMS. The Original Issue of a new drawing is revision 0A. Even though the EDMS system will produce revisions 0I & 0O they are not to be used. Use the modify tool in EDMS to change revisions to 0J & 0P respectively.

CAD file name is to be changed to reflect the Region, Document Number, Sheet Number, Revision and CAD file extension.

Refer to the EDMS online documentation for details.

## 5.4 Electronic File Naming Conventions

EDMS allocates electronic file names automatically. The file naming scheme will be based on “Ergon Region-Document Number-Sheet number-Revision” such that it will be unique for each document. Refer to the EDMS documentation for details.

## 5.5 Drawing Grid

The use of a grid will ensure the alignment of objects within the drawing. The applicable Grid Settings shall be:

Electrical/Comms Circuitry drawings:	Grid Master	4
	Grid Reference	10
	Unit Lock	1

Physical Drawings created with other disciplines’ do not require a grid.

## 5.6 Watermarks

Watermarks are to be placed on each drawing sheet as part of the CAD standard where applicable. They are part of the Ergon’s QA process & are to be utilised when printing or exiting the drawings.

Watermarks approved for use as part of the CAD Standard include:

1. Preliminary Only
2. Superseded
3. For Tender Purposes Only

## 5.7 Revision and Amendment Notes

All revised drawings shall have amendment notes added manually to the designated area of the border. These notes are to be concise, include work request (WR) number where applicable, and are to correspond to the document revision in the EDMS, as displayed in the border title text. For construction work to be done, the areas modified are to be clearly indicated using Revision Cloud or other suitable means.

## 5.8 International System of Units (SI) Considerations

The various files included in this customisation are based on Metric units. For this manual, SI, more commonly referred to as the metric system, is used to define such items as drawing scales, sheet sizes, and dimensioning. Refer to AS ISO 1998 for details.

All references to measurements and dimensioning are in millimetres (mm) or meters (m) as a standard working unit. When creating new files the appropriate seed/template file should be selected to define the working units of the new drawing. These settings are also to be used for Ergon Standard Frames and cell libraries.

## 5.9 Application of the Australian Standards

It should be noted that many of the items to be drafted within the various Ergon Energy's drawing disciplines are required to comply with the relevant Australian Standards.

## 6 Graphic Concepts

This section provides standards on graphic concepts for drawing presentation.

### 6.1 Presentation Graphics

The first step in establishing an effective CAD standard is the development of a uniform approach to presentation graphics. Presentation graphics typically consist of drawing elements such as lines, arcs, shapes, text, and their attributes (line colour, line width, and line style). This section presents brief overviews of the characteristics of presentation graphics and the philosophy used to standardize them.

### 6.2 Lines and Applications

A drawing which displays all line work with equal thickness will be seen to be confusing and difficult to interpret. If, however, the outline of the feature is thicker, and projection and dimension lines are thin, the outline of the feature becomes the salient feature and the drawing is more readily interpreted.

Therefore, by varying the thickness and construction of lines it is possible to express meaning in the drawing, which may otherwise be difficult to convey.

To ensure uniformity in interpretation, the use of each type and thickness of line is defined in the relevant international and Australian drafting standards.

Refer to standard template drawings for application of line types.

Further detailed information may be obtained from Standards Australia Technical drawing - General principles Part 101, section 3, Lines (AS 1100.101).




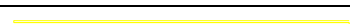
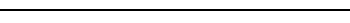




Types of lines for electrical drawings may be obtained from Standards Australia Preparation of Documents Used in Electrotechnology, Preparation of Documents Used in Electrotechnology - Part 1: General requirements (AS/NZS 4383.1).







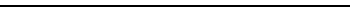
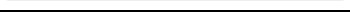
## 6.3 Line Widths

Varied line widths substantially improve the presentation of a drawing. Most commercial CAD systems provide an extensive variety of line widths however, five line widths defined in the Table 1 and 2 (weights 1 to 5), with the optional 0.15mm, 1.00 mm, 1.40 mm, and 2.00 mm lines, are considered sufficient and should not be expanded unless an appreciable improvement in drawing clarity or contrast can be realised. Line weights are shown in table 1 and 2.

**Table 1 Microstation line widths**

Line Thickness	mm	Microstation Colour	Microstation Line Weight	Line Weight Example
Very Fine	0.15	Co=3	Wt = 0	
Fine	0.18	Co=3	Wt = 1	
Thin	0.25	Co=0	Wt = 2	
Medium	0.35	Co=4	Wt = 3	
Wide	0.50	Co=6	Wt = 4	
Extra Wide	0.70	Co=7	Wt = 5	
Option 1	1.00	Co=5	Wt = 6	
Option 2	1.40	Co=2	Wt = 7	
Option 3	2.00	Co=9	Wt = 8	

**Table 2 AutoCAD line widths**

Line Thickness	mm	AutoCAD Colour and Index	AutoCAD Line Weight	Line Weight Example
Very Fine	0.05	Light Grey Co=251	Wt = default	
Fine	0.18	Grey Co=8	Wt = default	
Thin	0.25	White Co=7	Wt = default	
Medium	0.35	Red Co=4	Wt = default	
Wide	0.50	Green Co=3	Wt = default	
Extra Wide	0.70	Blue Co=5	Wt = default	

Where drawings are created at A1 size with heavier line thicknesses, and later plotted at A3 size, the corresponding reduction in plotted line thicknesses should be handled by the plotting process rather than by making any changes to the line weights in the drawing. This allows large drawing sheets to be plotted with adequate definition in the line thicknesses.

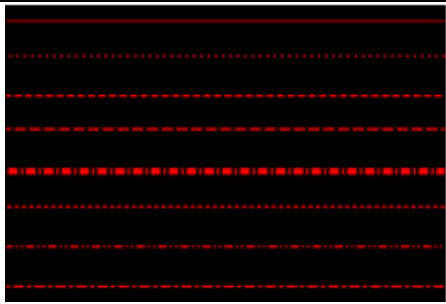
## 6.4 Line Styles

Line style definitions determine the particular dash-dot sequence and relative length of dashes, blank spaces and the characteristics of any included text or shapes. Working with line styles provides a means of distinguishing the purpose of one line from another.

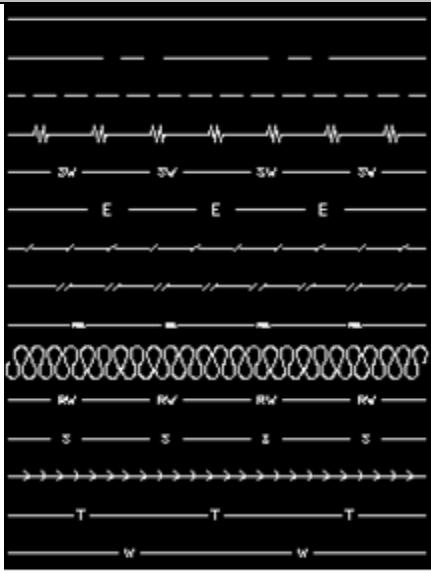
## 6.4.1 Basic Line Styles

Standard Line Styles are listed in the Table 3 and 4.

**Table 3 Standard Line Styles**

ID	Description	Example	Microstation Designator
0	Continuous – Default		Line Code 0
1	Dotted		Line Code 1
2	Dashed		Line Code 2
3	Dashed spaced		Line Code 3
4	Dashed dotted		Line Code 4
5	Short Dash		Line Code 5
6	Dashed double-dotted		Line Code 6
7	Short Dash Long Dash		Line Code 7
















**Table 4 Standard Line Styles**

ID	Description	Example
0	Continuous – Default	
1	Centre Line	
2	Dashed	
3	Over Head Earth	
4	Storm Water	
5	Electrical Assets	
6	Existing Fence	
7	New fence	
8	Fuel	
9	Insulation	
10	Rain water	
11	Sewer	
12	Soil Drain	
13	Telephone/Communications	
14	Water	

## 6.4.2 Custom Line Styles

Ergon Custom Line Styles, along with the standard line styles, are stored in resource files. These custom line styles are automatically selected where appropriate when using certain Ergon Standard toolbars for placement of elements.

**Table 5 Custom Line Styles Microstation**

ID	Description	Example
	Alarm	
	Block	
	Check	
	Close	
	CT	
	Initiate	
	Pulse	
	Supervision	
	Trip	
	VT	
	Digital Input	
	Analogue	
	Control	
	Communications	
	Serial	

### 6.4.3 Line Colour

The primary reason to use colour in CAD drawings is to improve the clarity of the drawing on a computer monitor.

Where colour is used to designate the intended plotted line thickness, colours should be used as per the table found in section 6.3, for all other colours use default colour table.

### 6.5 Fonts and Text Styles

The standard font is True Type Arial.

The objective is to provide distinct uniform letters and figures, which will be clearly legible in reproductions from the original drawings.

Upper case letters shall be used except where lower case symbols must be used for conventional units, signs and symbols normally using such characters, e.g. mm, kg, kPa, kWh, pH etc.

Height of characters should be related to the size of the drawing sheet, but should be one of the following 2.5, 3.5, 5, 7, 10, 14 & 20. However, the minimum height of characters should generally not be less than 2.5 mm for all sheets up to A1 size, and 3.5 mm for A0 and B1 size sheets.

This standard, regarding the heights of characters in titles and numbers, although being a departure from Standards Australia (AS 1100.101) is a requirement by Ergon Energy.

Additional information can be obtained from Standards Australia Technical drawing - General principles Part 101, section 4, Letters, Numerals and Symbols (AS 1100.101).

**Table 6 Character height**

Character Use	Character height (h) based on sheet size (mm)		
	A0 & B1	A1,A2,A3	A4
Drawing numbers	10	7	5
Titles	5	3.5	3.5
Sub-titles, headings, view and section designations etc.	5	3.5	3.5
General notes, material lists, dimensions etc.	3.5	2.5	2.5

Table 6 specifies minimum character heights for upper case lettering only. For upper and lower case combinations, the minimum character height should be one size larger than that specified in the table.

The minimum values stated in the table are suitable for copies produced according to current copying practice, i.e. A0 and A1 sizes reduced to A2 size, and A2, A3 and A4 sizes not reduced in size.

Character heights for engineering drawings are limited to the following: 2.5, 3.5, 5, 7, 10, 14, & 20.

The following settings have been defined for Ergon Text Styles in table 7.

**Table 7 Ergon Text Styles**

Text Style name	Text height (mm)	Text Colour
Ergon 1.5 mm	1.5	Red (3)
Ergon 1.8 mm	1.8	Red (3)
Ergon 2.5 mm	2.5	White (0)
Ergon 3.5 mm	3.5	Yellow (4)
Ergon 5.0 mm	5.0	Orange (6)
Ergon 7.0 mm	7.0	Cyan (7)
Ergon 10.0 mm	10.0	Magenta (5)
Ergon 14.0 mm	14.0	Green (2)
Ergon 20.0 mm	20.0	Grey (9)

Text shall be orientated to match the text direction in the drawing border. Text Justification should be such that any amendment to text negates the need to move text.

## 6.6 Scales

Recommended scales and their applications for use on Engineering Drawings shall be obtained from Standards Australia Technical drawing - General principles Part 101, section 5, Scales (AS 1100.101).

Typical drawing scales for various drawing types are indicated in table 8.

**Table 8 Engineering and Architectural Drawing Scales**

Category	Recommended scales		
Enlargement scales	50:1	20:1	10:1
	5:1	2:1	
Full Size			1:1
Reduction scales	1:2	1:5	1:10
	1:20	1:50	1:100
	1:200	1:500	1:1 000
	1:2 000	1:5 000	1:10 000

Typical drawing scales for various survey and mapping scales are indicated in table 9 refer to Standards Australia Technical drawing - General principles Part 101, section 5.4.2, Survey and mapping scales (AS 1100.101) for special purpose surveying and mapping scales that may also be acceptable.

**Table 9 Survey and Mapping Drawing Scales**

Category	Recommended scales			
Reduction scales			1:50	1:100
	1:200	1:250	1:500	1:1 000
	1:2 000	1:2 500	1:5 000	1:10 000
		1:25 000	1:50 000	1:100 000
		1:250 000	1:500 000	1:1 000 000

Schematics, circuit diagrams, schedules etc., should be created in a “Sheet” view at full size (sheet size). Drawing size may require drawing SLD in model view.

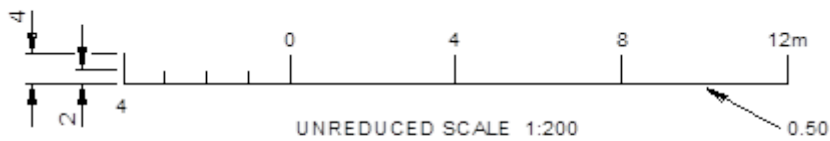
A single “Sheet” model will be used as the master for plotting and will have the Ergon standard border. The Design Model and any other information will be attached as References (eg standard panel outlines, etc) to the sheet model.

Where drawings are created to a scale, an appropriate scale bar(s) must be added to the drawing to allow for reduction printing and plotting.

Scaled drawings shall contain scale bars representing all scales shown on the drawing. Where there are multiple scales, these may be shown adjacent to the appropriate parts or alternatively located together at some convenient place on the drawing and labelled “ Scale A ”, “ Scale B ” etc.

Written scales, without an accompanying scale bar, e.g. 1 : 200, shall not be used.

The scale bar shall take the form of figure 1.



**Figure 1 Scale Bar Example**

For two or more units refer Standards Australia Technical drawing - General principles Part 101, section 5, Scales (AS 1100.101).

## 6.7 Dimensioning

The preferred unit of measure for most work is millimetres. Unit notations are unnecessary and should not be used. Also, a note should be added to the drawing stating, "All dimensions and/or dimensions shown in callouts/notes are in millimetres unless otherwise stated".

For site plans or other drawings drawn to scales over 1:200, the unit of measure is typically meters. Where greater accuracy is required, show dimensions to three decimal places. A note should be added to the drawing stating, "All dimensions and/or dimensions shown in callouts/notes are in meters unless otherwise stated."

Depending on the discipline menu being used, there will be two options to activate Corporate Dimension Styles to maintain standards. One is set in millimetres and the other is set for metres.

The millimetres dimension style is set with an accuracy of one decimal place. The metres dimension style is set with an accuracy of three decimal places.

Regardless of the working units being used for that drawing, these are the values that will be displayed.

## 7 Model Files and Sheet Files

Two distinct types of models within a CAD file are addressed in this document:

- Design Models
- Sheet Models

A Design Model contains the physical components of a drawing. Design Models are drawn at full scale and typically represent something physical in the built environment.

A Sheet Model is synonymous with a plotted CAD drawing file. A Sheet Model is a selected view or portion of the Design Model within a border sheet. A sheet model is the combination of referenced design models with sheet-specific text/symbols to create a final ready-to-plot CAD file. Sheet models are not scaled. The Design Model is referenced into the sheet model at the desired scale as required.

Dimensions and text are only placed on the Sheet Model.

As a schematic drawing contains a logical (rather than a physical) representation of the components, this will normally be drawn at a size to match its final plotted size (typically A1) and hence there will be no need to scale the border sheet or the final plot.

Although it is possible to have more than one Sheet Model in a single drawing file, Ergon standards dictate that a drawing file shall contain a maximum of one Sheet Model and one Design Model.

Drawings in Electrical/Comms discipline should be drawn in the Sheet model.

The Design Model and the Sheet Model should be named by default.

In AutoCAD terminology a Design Model is the equivalent of Model Space whilst a Sheet Model equates to Paper Space.

## 8 Level/layer Structure

Ergon specific standard files have been created for each level group with standard levels following the rules described below. The use of standard files means that levels are available to the user without having to be first created.

For simple drawings, schematics, diagrams, sketches etc, only the Corporate Level structure is to be used. When a drawing type requires more feature separation, Standard Level Groups can be further developed as required by each workgroup, for its particular drawing discipline.

### 8.1 Levels/Layers

CAD levels or layers are analogous to overlays in manual drafting systems and serve to separate graphic elements (lines, shapes, text etc.) according to the design aspect they represent.

GIS (ie Smallworld) and survey drawings will follow their own level structure.

Currently 5 Drawing Types and their Standard Level Groups have been identified in Table 10.

**Table 10 Standard level groups**

Drawing Types	Standard Level Groups
Electrical/Comms Diagrams	Corporate Levels
Civil/Physical Arrangements	Corporate Levels + Level Group 1
Mechanical	Corporate Levels + Level Group 2
System Diagrams	Corporate Levels + Level Group 3
Lines/Mapping	Corporate Levels + Level Group 4

Each Standard Level Group is further broken down as follows

## **CORPORATE**

1\_LINES  
2\_CELLS  
3\_TEXT  
4\_DIMENSIONS  
5\_PATTERNS  
6\_BORDERS  
7\_DRAWING TITLE  
8\_REVISION CLOUDS  
9\_SKETCH  
10\_HATCH  
WATERMARK PRELIMINARY ONLY  
WATERMARK SUPERSEDED BY  
WATERMARK TENDER PURPOSES

## **LEVEL GROUP 1**

BATTERS  
BLOCKWORK  
BUILDING  
BUILDING PAD  
CABLE DUCT AND PITS  
CONDUCTORS AND BUSBARS  
CONDUITS AND TRENCHS  
CONTOURS  
DRAINAGE  
HYDRAULICS  
EARTH GRID  
EQUIPMENT STRUCTURES  
FENCE  
FOOTING  
EQUIPMENT PRIMARY PLANT  
EQUIPMENT SECONDARY SYSTEMS  
CADASTRE  
REINFORCING  
ROAD  
SETOUT LINES  
SERVICES  
DEMOLITION  
MISCELLANEOUS

## **LEVEL GROUP 2**

CHARGE AIR COOLING SYSTEM  
COMPRESSED AIR SYSTEM  
EXHAUST SYSTEM  
FUEL SYSTEM  
LUBE OIL SYSTEM  
PLANT  
STREAM SYSTEM  
WASTE SYSTEM  
WATER COOLING SYSTEM



## LEVEL GROUP 3

APPROVED  
MISCELLANEOUS  
PENDING  
UNAVAILABLE  
WATERMARK NOT FOR OPERATIONAL USE  
WORKPLAN NO  
ZONE SUB

## LEVEL GROUP 4

0.18 mm  
0.25 mm  
0.35 mm  
0.50 mm  
0.70 mm  
1.0 mm  
1.4 mm  
2.0 mm

Descriptions of the intended use of various levels in the Standard Level Groups are provided in Annex A.

## 8.2 Reference Files

Reference files (external references) can enable designers to share drawing information electronically, eliminating the need to exchange hard copy drawings between the design disciplines. For example, with the use of reference files, the general arrangement or structural details of a substation can share aspects of the civil layout.

Where temporary use is made of other reference files during the drawing's creation process, they must be detached before adding the file to the EDMS or, for currently registered documents, before transitioning the drawing for approval signatures. The external referenced file's border and title must not be copied to the active drawing, only the contents.

Reference files with the exception of imagery files shall not be used.

The Ergon CAD Standards Workspace will allow raster/image files of various formats to be attached and manipulated.

## 9 Cell and Block

### 9.1 Introduction

A cell in MicroStation or block in ACAD is a group of graphical elements that can be manipulated as a single entity. Examples of typical cells/blocks are windows, doors, graphic scale keys, furniture, etc. The use of such symbology enhances CAD productivity and provides an excellent opportunity for CAD standardisation and efficiencies.

## 9.2 Electronic Version of the Symbology/Elements Cells

Standard, version controlled and centrally located Cell/Block Libraries are an integral part of this standard and shall be maintained and used.

## 10 Guidelines for Microstation Users

### 10.1 Introduction

All new MicroStation drawings are to be created from Ergon Energy work space and seed files. Selecting tools from the Ergon Standards Workspace will invoke active level placement settings and appropriate colours, line weights as well as dimension and text styles.

It is important for Microstation users to select an already-defined 'Project' when creating drawings in Microstation, as this project configures specific settings to conform to Ergon Energy CAD Standards.

Examples of settings configured by the project selection include (but are not limited to):

- Menu Options
- Line Styles
- Text Styles
- Dimension Styles
- Seed Files
- Levels

Selecting tools from the Ergon Standards Workspace will invoke active level placement settings and appropriate colours, line weights as well as dimension and text styles.

Users who are creating/modifying drawings for Ergon, whether they be internal staff or external contractors, are required to use the defined projects configured in Microstation, so as to ensure conformity to the Ergon Energy CAD Standards.

Choose the following Workspace options:

- User – By default, it will pick up your windows login. This should be used for normal MicroStation operation.
- Project – Select the project for the type of drawing you are creating or working on. This will load the resources appropriate to that drawing type. Project options are based on Drawing Disciplines.
- Interface – Choose the interface (custom toolbars, menus etc) to be used during your session. An interface should exist named after your Windows login. This by default will be chosen for you. If this is not available, then select "Interface- New" and create one using your login name.

Otherwise the “default” will be used.

Where a raster file is attached, it shall be attached using the “Raster Manager” functionality of MicroStation but modified using Descartes software. Refer to Descartes User Guide.

Two seed files have been set up with predetermined working units:

- "millimetre" file (UOR 1000 pu per mm) – refer eDMS 929876-01
- "metre" file (UOR 1000 pu per m) which provides 1mm resolution. – refer eDMS 929877-01

These seed files have been used to create the Ergon Standard Borders and cell libraries. These are also available in Ergon standard work space environments.

## 10.2 Exiting a Drawing File or Opening another File

When working on design drawings, an exit routine has been developed to automatically leave a drawing in a certain way, so when it is opened the next time, or viewed from the EDMS it is being viewed correctly.

This exit routine will enable and disable certain view attributes, enable certain locks, and leave the drawing with a certain watermark displayed.

Upon exit, the author is required to apply an appropriate watermark, which indicates the current drawing status.

This is to avoid the premature use of a drawing which is under development (and therefore unapproved).

Refer to Annex B for Exit Routine details.

## 11 Guidelines for AutoCAD Users

### 11.1 Reference files

When reference files are used, they must be permanently attached to the drawing with the BIND command before submission.

### 11.2 Line types

For a uniform look of standard line types according to ISO 128-20, the line definition file ACADISO.LIN should be used.

### 11.3 Using DWG templates files

A DWG template can be used to establish project standards. Every time that you create a DWG file, you can use the DWG template file that contains the project's standard level (DWG layer) configuration, text and dimension style, working units (DWG units), and line style (DWG linetype) settings. Refer to eDMS 929875-01.

## 12 Borders Sheets and Titles

### 12.1 Drawing Sheet Sizes

Typical drawings will be prepared on A-series sheets in accordance with the ISO sheet size shown in the Table below in 10.1.1. Also a sheet size B1 has been supplied.

After selecting the border size, a cell/block is automatically placed by the bottom left corner, at the origin of 0, 0.

The border elements are of colour 0 (white) as they are part of a cell/block.

Vertical borders are to have all drawing text placed so it is readable when viewed naturally from the bottom, right-hand corner of the title block.

#### 12.1.1 ISO, Sheet Size Comparison

The outer edge of all sheet sizes shall be defined with a thin, solid construction line. The outer edge dimensions are equal to the sheet size (Ref AS 1000.101).

Table 11 ISO Sheet Size

ISO Designation	Width (mm)	Length (mm)
A0	841.00	1189.00
A1	594.00	841.00
A2	420.00	594.00
A3	297.00	420.00
A4	210.00	297.00
B1	707.00	1000.00

#### 12.1.2 Title Block & EDMS Integration

The title block will be placed as a cell containing a set of Tags which are integrated with the EDMS. The title block values (the tags) will be automatically populated by using the “Checkout/Launch” tool, once a drawing is entered into the EDMS. Refer to Note 1 below.

External contractors shall enter title block information by unlocking the level “7\_Drawing Title” using Level Manager or preferably the Attributes Level Display toolbox.

Then use the “Edit Tags” tool to change or remove text. This is the only acceptable method. Refer to Note 2 below.

Under no circumstances shall these Tags to be moved, deleted or turned off, as they are required by the EDMS integration.

Both Border and Title block text information are, by default, locked from accidental movement or deletion. If it is necessary, to unlock levels '6\_Borders' and '7\_Drawing Title' to manipulate any existing information, the levels will relock on exiting the file.

## Note 1:

If a new border & title text cell is added to an existing drawing, do not check the drawing back into EDMS. Select the 'Leave Checked Out' option & then either relaunch the document from the EDMS or use the "Checkin" option from EDMS. This way when the document is reopened, the data from EDMS will populate to the drawing title.

Be aware that if you use the 'Check Back In' option when closing a drawing, any incorrect drawing title data will overwrite the EDMS. If this happens, use "Modify" to correct the EDMS data then "Checkout/Launch" to repopulate the drawing title.

## Note 2:

If Contractors are given bulk numbers, & as such EDMS has dummy records, to avoid the EDMS writing from library to file & probably corrupting the title data entered by contractors, start Microstation first from your shortcut or start menu, & then use the File Open command to open the drawing. This way there is no interaction with EDMS until you check the document back in, where the data from the drawing will populate the EDMS. Any corrections are then done with "Modify", as per note 1.

For further instruction on title block population, refer EDMS online Guidelines.

## 13 Plotting

Plotting of final drawings should always be performed from the Sheet Model/View, as the Design Model/View contains information that can be referenced to create the final Sheet Model/View layout.

Using a sheet model/view for plotting will automatically pick up the sheet's boundary as the printing area.

Ergon standard border sheets contain border sheet line work and the title block.

Border Sheets will be placed as cells into the Sheet Model/View with the drawing-specific title block information, which will be manually or automatically populated by the EDMS (Refer to EDMS documentation).

Plotting will generally be performed with line weights on. That is to say that the line weight/colour of an element will control the line width at which it is plotted when creating a monochrome plot (this represents the majority of plots produced by Ergon). Colour plotting is used for network schematics and lines design drawings. The line widths will be determined by the plot drivers and their associated pen tables used.

Using the "Sheet Model" approach to plotting, sheet extent will be displayed on the screen which will simplify the creation of scaled plots (when used with "Full Sheet" option during plotting).

## 13.1 Background

A list of the included Ergon MicroStation and Auto CAD printer driver files is shown below.

**Table 12 Standard Printer Files**

ISO Designation	Details
01 Ergon Full Size	Standard printer driver file to be used at any office for full size plots.
02 Ergon A0-A2 Reduction	Standard printer driver file to be used at any office for A0 to A2 reduction plots.
03 Ergon A1-A2 Reduction	Standard printer driver file to be used at any office for A1 to A2 reduction plots.
04 Ergon A1-A3 Reduction	Standard printer driver file to be used at any office for A1 to A3 reduction plots.
05 Ergon A2-A3 Reduction	Standard printer driver file to be used at any office for A2 to A3 reduction plots.
06 Ergon A3-A4 Reduction	Standard printer driver file to be used at any office for A3 to A4 reduction plots.
10 Ergon Full Size PDF	Standard printer driver file to be used at any office for full size plots to a PDF format file. Note that no reduction print drivers were created for PDF output since the Adobe Reader software should print to any paper size and scale the output accordingly.

## Annex A Level Structures

This Annex provides further details on level types.

**Table 13 Corporate Level**

Level name	Description
1_LINES	Line work in drawing
2_CELLS	All circuit symbols, cells
3_TEXT	Text & notes within drawing
4_DIMENSIONS	Witness, leader, arrow and text
5_PATTERNS	Patterns in drawing
6_BORDERS	Border line work
7_DRAWING TITLE	All text in Drawing Border
8_REVISION CLOUDS	All Revision Clouds and notes
9_SKETCH	Information / Construction level
10_HATCH	Hatching in Drawing
WATERMARK PRELIMINARY ONLY	Preliminary only - overlay text
WATERMARK SUPERSEDED BY	Superseded by - overlay text
WATERMARK TENDER PURPOSES	For Tender Purposes Only- overlay text

**Table 14 Level Group 1**

Level name	Description
BATTERS	Cut and Fill line work
BLOCKWORK	Details of Blocks and Bricks
BUILDING	Complete Building for non-building drawings
BUILDING PAD	Building civil pad
CABLE DUCT AND PITS	Underground cable trench & pits
CONDUCTORS BUSBARS	Energised solid & flexible conductors including connectors
CONDUITS AND TRENCHS	All underground trenches for conduits including fittings
CONTOURS	Earthworks, Ground line
DRAINAGE	Storm water, pits
HYDRAULICS	Site hydraulics including oil separators systems, sewerage and water supply
EARTH GRID	Earth grid, connectors and tails
EQUIPMENT STRUCTURES	Poles, towers, beams etc not integral to equipment supply
FENCE	Boundary, security, temporary and internal fence.
FOOTING	Concrete details including reo and rag bolts
EQUIPMENT PRIMARY PLANT	Primary plant, include support structures if integral supply
EQUIPMENT SECONDARY	Secondary Systems physical items

SYSTEMS	
CADASTRE	Parcel boundary and easements linework
REINFORCING	Concrete footing & building reinforcing
ROAD	Road details including kerb
SETOUT LINES	Equipment and footing set out
SERVICES	Underground services, sewer, potable water, grey water, Telstra/communications
DEMOLITION	Items to be removed
MISCELLANEOUS	Physical items not included in above layers such as landscape, street furniture

**Table 15 Level Group 2**

Level name	Description
CHARGE AIR COOLING SYSTEM	
COMPRESSED AIR SYSTEM	
EXHAUST SYSTEM	
FUEL SYSTEM	
LUBE OIL SYSTEM	
PLANT	
STREAM SYSTEM	
WASTE SYSTEM	
WATER COOLING SYSTEM	

**Table 16 Level Group 3**

Level name	Description
APPROVED	
MISCELLANEOUS	
PENDING	
UNAVAILABLE	
WATERMARK NOT FOR OPERATIONAL USE	
WORKPLAN NO	
ZONE SUB	

**Table 16 Level Group 4**

Level name	Description
0.18	Line Weight 1
0.25	Line Weight 2
0.35	Line Weight 3
0.50	Line Weight 4
0.70	Line Weight 5
1.00	Line Weight 6
1.40	Line Weight 7
2.00	Line Weight 8



## Annex B Exit Routines

### B.1. Microstation

The following is the list of things executed by the exit routine (or file close or open events).

#### **Check the drawing discipline of the file.**

If nothing is specified, will exit without setting anything. (E.g. pre-standards drawings)

#### **Change to the first Sheet Model found in the file.**

#### **Set AccuDraw and AccuSnap settings**

- autoload on
- floatorigin on
- contextsens on
- accusnap on

#### **Set all View Attributes**

- SET ACSDISPLAY OFF
- SET BACKGROUND OFF
- SET REFBOUND OFF
- SET CAMERA OFF
- SET CONSTRUCT OFF
- SET DIMENSION ON
- SET DYNAMIC ON
- SET ED OFF
- SET DISPLAYSET OFF
- SET CELLS OFF
- SET CURVES SLOW
- SET FONT SLOW
- SET FILL ON
- SET LVLSYMB OFF
- SET WEIGHT ON
- SET PATTERN ON
- SET TEXT ON
- SET NODES OFF
- SET SHARECELL OFF
- COLOURTABLE DEFAULT

#### **Set all locks**

- Lock grid off
- Lock level off
- Lock textnode off
- Lock ggroup off
- Lock association on
- Lock axis off
- Lock isometric off
- Lock snap on
- Lock snap keypoint; ky=2
- Lock useannotationscale

#### **Set association lock on for the dimension tools**

## **If drawing discipline is Electrical/Comms Diagrams**

- Set GRID ON for all views
- Set the grid master to 4
- Set the grid reference to 10
- Lock unit on and a value of 1
- Un-rotate the views
- Otherwise set the GRID OFF

## **Set Fence to block & inside**

## **Set Measure distance tool to "Between Points"**

## **Set ARC to edge**

## **Turn on true scale in the place active cell dialog**

### **Set:**

- ACTIVE LEVEL to default
- ACTIVE ANGLE = 0
- ACTIVE SCALE = 1
- ACTIVE AXIS ORIGIN = 0
- AXIS INCREMENT ANGLE = 90
- COLOUR = 0
- LINE CODE = 0
- WEIGHT = 0
- ACTIVE CLASS = PRIMARY

## **Prompt the user to select a watermark**

## **Lock the Border and Title Text levels**

## **Fit sheet view and save settings**

## **Close File**

## **B.2. AutoCAD**

Exit routine for AutoCAD users to be developed.